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Some Essential Statistics of Cancer Mortality Throughout the World

By

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NEWARK, N. J.

PUBLICATIONS OF THE
AMERICAN SOCIETY FOR THE CONTROL OF CANCER
105 EAST 22ND STREET, NEW YORK

Bulletin 8

December, 1915



SOME ESSENTIAL STATISTICS OF CANCER MORTALITY THROUGH- OUT THE WORLD

By

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This reprint is a part of the Commemoration Volume, issued by the American Medical Association at its meeting in San Francisco, June 22 to 26, 1915, as a tribute to the medical sciences, which made possible the building of the Panama Canal and the Panama Pacific Exposition.

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SOME ESSENTIAL STATISTICS OF CANCER MORTALITY THROUGHOUT THE WORLD

In the furtherance of international cancer studies, it is obvious that the first prerequisite is trustworthy and comparable cancer mortality statistics. In course of time cancer morbidity data should become available through the cooperation of large hospitals and special institutions for the treatment of cancer patients. An additional source of information should be the consolidated experience data of American and foreign life insurance companies. The amount of existing statistical information on the subject of cancer is truly enormous. In a forthcoming work on *The Mortality from Cancer Throughout the World*, I have made an earnest effort to bring together in a comparable form the information most likely to be useful in the furtherance of cancer research, so far as the statistical data can be of value in this direction.

Aside from the scientific necessities of the existing situation, the statistical data are useful in advancing the nation-wide effort at cancer control through the required education of the medical profession and the laity as regards the menace of cancer and the urgency of improved methods of early diagnosis and of more qualified medical or surgical treatment of cancer in the early stages of the disease. It would serve no purpose to restate on this occasion the rather extended argument advanced in behalf of the utility of the statistical method in the study of the cancer problem in the work referred to, and it has therefore seemed better to limit the present discussion to a brief restatement of the salient facts of the worldwide study of the cancer problem on the basis of at least reasonably trustworthy and, in practically every case, official mortality returns.

It may not be out of place, however, briefly to refer to the often repeated argument, that on account of inherent difficulties of exact diagnoses, the returns, particularly for earlier periods, are intrinsically untrustworthy and therefore not strictly comparable with the statistics of the present day. Nevertheless it has properly been pointed out by the late Mitchell Banks that, "while the diagnosis of cancer is probably made much more frequently now than in former times, it required little skill to make the diagnosis at the time of the death of the patient. The diagnosis at such a time was by no means beyond the ability of even the rural practitioner of fifty years ago." The argu-

ment derived exclusively from necropsy records, that the clinical diagnosis of cancer is often at variance with the facts, is in all probability decidedly overdrawn. Discrepancies between the clinical and anatomic diagnoses are much more common, in any event, in the case of many other important diseases than in that of cancer; and the evidence has not been forthcoming that in any considerable number of cases cancer deaths have been erroneously diagnosed as due to other causes, more or less allied with malignant disease. There exists a confusion of thought, caused in part by the misconception that the terminal diagnosis of cancer which underlies the certificate of death, is assumed to be identical with the initial diagnosis of the disease, which, it hardly requires to be said, ever has been and ever is likely to be a most difficult problem confronting the physician at the bedside. On the basis of what is probably the most comprehensive statistical study ever made of a single disease in the history of medicine, I feel absolutely confident that the returns regarding the mortality from cancer are, in the main, trustworthy and strictly comparable for a considerable period of time.

Subject to the foregoing observations, the accompanying tables are presented, with the further explanation that the required amplification of the data and the discussion of the problems resulting therefrom are made conveniently accessible in the work previously referred to, which will be printed for gratuitous distribution in behalf of the cancer cause, by the Prudential Insurance Company of America.

Table 1 indicates the approximate cancer death rate of the different continents and for the world at large, for the five years ending with 1912:

TABLE 1.—MORTALITY FROM CANCER, REGISTRATION COUNTRIES OF THE WORLD, PERIOD 1908-1912

Continent	Total Population	Deaths from Cancer	Rate per 100,000 Population
Africa	9,041,866	3,018	33.4
America	382,293,573	251,535	65.8
Asia	272,814,962	148,447	54.4
Australia	27,939,842	20,276	72.6
Europe	1,425,516,942	1,082,704	76.0
Total	2,117,607,185	1,505,980	71.1

Table 1 is based on a total population of civilized countries, about 440,000,000, or about 25 per cent. of the entire population of the world, estimated for the year 1911.

The statistics for the principal European countries are given in Table 2, for the period 1896-1910, to facilitate the convenient comparison of the rate for three quinquennial periods.

TABLE 2.—MORTALITY FROM CANCER IN EUROPEAN COUNTRIES, PERIOD 1896-1910

Country	Rates per 100,000 Population—		
	1896-1900	1901-1905	1906-1910
England and Wales.....	80.1	86.7	94.0
Scotland	77.1	84.8	99.7
Ireland	58.1	68.5	78.8
Norway	85.7	94.9	96.6
Denmark*	118.9	129.1	137.3
German Empire.....	70.8	77.7	84.2
Holland	91.9	97.8	103.5
Switzerland	127.4	128.3	125.9
Austria	68.9	74.7	78.3
Hungary	30.7	39.1	43.6
Italy	50.9	55.2	63.6
France*	97.3	92.1	102.7
All countries.....	69.1	74.2	81.0

* Cities only.

According to this table, the European cancer death rate has increased from 69.1 during the first five years to 74.2 during the second, and finally to 81.0 during the third.

The geographic distribution of cancer according to latitude for 130 of the world's largest cities, also for the period 1908-1912, is shown in Table 3.

TABLE 3.—MORTALITY FROM CANCER IN CITIES ACCORDING TO LATITUDE, PERIOD 1908-1912

No. of Cities	Degrees of Latitude	Population 1912	Aggregate Population	Deaths from Cancer	Rate per 100,000 Population
35	50 N.-70 N.	23,980,086	112,912,675	119,374	105.7
48	40 N.-50 N.	27,519,705	131,256,257	121,216	92.4
24	30 N.-40 N.	10,195,197	47,944,253	37,451	78.1
7	10 N.-30 N.	2,780,447	13,476,168	5,696	42.3
4	10 S.-10 N.	559,630	2,583,495	1,056	40.9
7	10 S.-30 S.	1,806,951	8,066,144	3,040	37.7
5	30 S.-40 S.	2,678,287	12,297,218	11,048	89.8
130		69,520,303	328,536,210	298,881	91.0

It is shown by Table 3 that the average cancer death rate for 130 cities was 91.0 per 100,000 of population; that the rate was highest in the most northerly inhabited latitudes, or that section of the globe which is comprehended between 50 and 70 degrees north latitude, and that for this section the rate was 105.7 diminishing to 92.4 for the cities located between 40 and 50 degrees, to 78.1 for cities between 30 and 40 degrees, to 42.3 for cities between 10 and 30 degrees, to 40.9 for cities between 10 degrees north latitude and 10 degrees south latitude, and finally, to 37.7 for cities between 10 and 30 degrees south latitude. In the most southerly inhabited belt, between 30 and 40 degrees south latitude, the cancer death rate again rose to 89.8, which is practically equivalent to the rate for 30 to 50 degrees north latitude. Table 3, therefore, would seem to warrant the important conclusion that cancer frequency is to a limited extent determined by latitude, which, of course, more or less represents the factor of climate and

weather conditions; in other words, cancer is excessively common in the temperate zone, moderately common in the medium zone and relatively rare in the torrid or semitorrid zone, which for the present purpose may be construed to include the belt between latitude 30 north and latitude 30 south.

The possible relation of cancer mortality to the size of cities is of some importance in view of the unquestionable effect of the admission of non-residents to hospital treatment and the non-correction of the death rates by the redistribution of deaths according to the residence of the deceased. In the case of small cities with exceptional hospital facilities this factor, no doubt, is of considerable weight, but in the case of large cities, the influence is relatively slight.

TABLE 4.—MORTALITY FROM CANCER IN CITIES, ACCORDING TO SIZE, PERIOD 1908-1912

No. of Cities	Size	Population 1912	Aggregate Population	Deaths from Cancer	Rate per 100,000 Population
14	1,000,000 and over	30,872,254	147,889,255	137,531	93.0
67	250,000 to 1,000,000	31,907,716	148,806,139	133,286	89.6
49	Less than 250,000	6,740,333	31,840,816	28,064	88.1
130		69,520,303	328,536,210	298,881	91.0

The cancer mortality statistics for the United States are limited to the registration area, which in 1913 comprehended about 65 per cent. of the total population. Table 5 shows first the estimated mortality from cancer in the continental United States, and second the actual mortality as reported for the registration area. The rates returned for the latter have been applied to the population estimates of the former.

TABLE 5.—ESTIMATED MORTALITY FROM CANCER IN CONTINENTAL UNITED STATES AND ACTUAL MORTALITY FROM CANCER IN UNITED STATES REGISTRATION AREA, PERIOD 1900-1913

Year	Population Continental United States	Cancer Death Rate per 100,000, U. S. Registration Area	Est. No. Deaths from Cancer	Population United States Reg. Area	Deaths from Cancer	Rate per 100,000 Population
1900	75,994,575	62.9	47,829	30,794,273	19,381	62.9
1901	77,592,344	64.3	49,890	31,370,952	20,171	64.3
1902	79,190,113	65.1	51,542	32,029,815	20,847	65.1
1903	80,787,882	68.3	55,153	32,701,083	22,325	68.3
1904	82,385,651	70.2	57,794	33,349,137	23,395	70.2
1905	83,983,420	71.4	59,931	34,094,605	24,330	71.4
1906	85,581,189	69.1	59,155	41,983,419	29,020	69.1
1907	87,178,958	70.9	61,840	43,016,990	30,514	70.9
1908	88,776,727	71.5	63,494	46,789,913	33,465	71.5
1909	90,374,496	73.8	66,731	50,870,518	37,562	73.8
1910	91,972,266	76.2	70,099	53,843,896	41,039	76.2
1911	93,570,036	74.3	69,494	59,275,977	44,024	74.3
1912	95,167,806	77.0	73,282	60,427,247	46,531	77.0
1913	96,765,576	78.9	76,319	63,298,718	49,928	78.9

For the year 1914 it would seem an entirely safe assumption that the aggregate mortality from cancer approaches, if it does not exceed, 79,000.

The comparative mortality of males and females from cancer in the United States registration area for the period 1900-1913, is shown in Table 6.

TABLE 6.—MORTALITY FROM CANCER, ALL ORGANS AND PARTS, BY SEX, UNITED STATES REGISTRATION AREA, PERIOD 1900-1913

Year	Males			Females		
	Population	Deaths from Cancer	Rate per 100,000 Population	Population	Deaths from Cancer	Rate per 100,000 Population
1900	15,415,757	7,294	47.3	15,378,516	12,087	78.6
1901	15,742,434	7,706	49.0	15,628,518	12,465	79.8
1902	16,111,848	7,798	48.4	15,917,967	13,049	82.0
1903	16,489,113	8,422	51.1	16,211,970	13,903	85.8
1904	16,856,270	8,881	52.7	16,492,867	14,514	88.0
1905	17,274,352	9,189	53.2	16,820,253	15,141	90.0
1906	21,322,133	11,166	52.4	20,661,286	17,854	86.4
1907	21,899,144	11,800	53.9	21,117,846	18,714	88.6
1908	23,876,529	13,046	54.6	22,913,384	20,419	89.1
1909	26,020,431	14,913	57.3	24,850,087	22,644	91.1
1910	27,606,526	16,373	59.3	26,237,370	24,666	94.0
1911	30,463,411	17,525	57.5	28,812,566	26,499	92.0
1912	31,128,193	18,464	59.3	29,298,940	28,067	95.8
1913	32,681,358	20,045	61.3	30,617,806	29,883	97.6

During the year 1913 it is shown that the cancer death rate for males was 61.3 and the rate for females was 97.6. There was, therefore, an actual excess in the mortality of women of 36.3 per 100,000 of population; or, in other words, to every 100 deaths from cancer among women, there were only sixty-three deaths from cancer among men.

The cancer mortality returns for most countries are on the basis of the international classification of causes of death, reduced to seven groups, respectively, buccal cavity, stomach and liver, peritoneum and intestines and rectum, female generative organs, female breast, skin, and other or not specified organs. On account of their special importance, the statistics for the registration area are given for certain selected groups in Tables 7, 8 and 9.

TABLE 7.—MORTALITY FROM CANCER OF THE STOMACH AND LIVER, BY SEX, UNITED STATES REGISTRATION AREA, PERIOD 1900-1913

	Males and Females		Males		Females	
	Deaths from Cancer	Rate per 100,000 Population	Deaths from Cancer	Rate per 100,000 Population	Deaths from Cancer	Rate per 100,000 Population
1900	6,918	22.5	3,418	22.2	3,500	22.8
1901	7,095	22.6	3,594	22.8	3,501	22.4
1902	7,483	23.4	3,681	22.8	3,802	23.9
1903	8,193	25.1	4,037	24.5	4,156	25.6
1904	8,744	26.2	4,340	25.7	4,404	26.7
1905	8,939	26.2	4,388	25.4	4,551	27.1
1906	10,946	26.1	5,443	25.5	5,503	26.6
1907	11,596	27.0	5,779	26.4	5,817	27.5
1908	13,044	27.9	6,537	27.4	6,507	28.4
1909	14,915	29.3	7,477	28.7	7,438	29.9
1910	16,475	30.6	8,135	29.5	8,340	31.8
1911	17,365	29.3	8,698	28.6	8,667	30.1
1912	18,517	30.6	9,215	29.6	9,302	31.7
1913	19,767	31.2	9,749	29.8	10,018	32.7

TABLE 8.—MORTALITY FROM CANCER OF THE FEMALE GENERATIVE ORGANS AND FEMALE BREAST, UNITED STATES REGISTRATION AREA, PERIOD 1900-1913

Year	Female Generative Organs			Female Breast		
	Deaths from Cancer	Rate per 100,000 Total Population	Rate per 100,000 Female Population	Deaths from Cancer	Rate per 100,000 Total Population	Rate per 100,000 Female Population
1900	2,696	8.8	17.5	1,400	4.5	9.1
1901	2,919	9.3	18.7	1,621	5.2	10.4
1902	3,033	9.5	19.1	1,734	5.4	10.9
1903	3,289	10.1	20.3	1,777	5.4	11.0
1904	3,436	10.3	20.8	2,019	6.1	12.2
1905	3,637	10.7	21.6	1,994	5.8	11.9
1906	4,090	9.7	19.8	2,421	5.8	11.7
1907	4,388	10.2	20.8	2,590	6.0	12.3
1908	5,250	11.2	22.9	3,023	6.5	13.2
1909	5,714	11.2	23.0	3,585	7.0	14.4
1910	6,147	11.4	23.4	3,730	6.9	14.2
1911	6,707	11.3	23.3	4,190	7.1	14.5
1912	7,089	11.7	24.2	4,356	7.2	14.9
1913	7,706	12.2	25.2	4,514	7.1	14.7

TABLE 9.—MORTALITY FROM CANCER OF THE SKIN, BY SEX, UNITED STATES REGISTRATION AREA, PERIOD 1900-1913

Year	Males and Females		Males		Females	
	Deaths from Cancer	Rate per 100,000 Population	Deaths from Cancer	Rate per 100,000 Population	Deaths from Cancer	Rate per 100,000 Population
1900	602	2.0	392	2.5	210	1.4
1901	683	2.2	456	2.9	227	1.5
1902	688	2.1	454	2.8	234	1.5
1903	752	2.3	484	2.9	268	1.7
1904	758	2.3	462	2.7	296	1.8
1905	818	2.4	539	3.1	279	1.7
1906	984	2.3	656	3.1	328	1.6
1907	1,121	2.6	724	3.3	397	1.9
1908	1,282	2.7	827	3.5	455	2.0
1909	1,492	2.9	988	3.8	504	2.0
1910	1,459	2.7	952	3.4	507	1.9
1911	1,619	2.7	1,011	3.3	608	2.1
1912	1,743	2.9	1,079	3.5	664	2.3
1913	1,725	2.7	1,128	3.5	597	1.9

Cancer is largely, if not primarily, a function of age, or more accurately, of senility and presenility. The mortality at ages under 35 is relatively small, and is chiefly due to sarcoma, for which, however, no separate returns are required under the international classification.

Table 10 exhibits the mortality from cancer by sex and age in the United States registration area, for the period 1903-1912.

TABLE 10.—MORTALITY FROM CANCER OF ALL ORGANS OR PARTS, BY AGE AND SEX, UNITED STATES REGISTRATION AREA, PERIOD 1903-1912

Ages at Death	Males		Females		Increase or Decrease	
	Deaths from Cancer	Rate per 100,000 Population	Deaths from Cancer	Rate per 100,000 Population	Actual	Per cent.
Under 10	1,170	2.5	984	2.2	— 0.3	12.0
10-24	2,028	3.1	1,844	2.8	— 0.3	9.7
25-34	3,757	9.0	7,891	20.6	+ 11.6	128.9
35-44	10,750	32.3	26,779	89.0	+ 56.7	175.5
45-54	24,431	105.4	46,669	222.9	+ 117.5	111.5
55-64	35,327	257.4	50,393	386.4	+ 129.0	50.1
65-74	33,745	452.8	43,010	565.7	+ 112.9	24.9
75 and over	18,381	620.2	24,601	734.1	+ 113.9	18.4
All ages *	129,784	55.7	202,421	90.6	+ 34.9	62.7
45 and over	111,884	236.5	164,673	366.4	+ 129.9	54.9

* Including unknown ages.

It is shown by this table that, excepting ages under 25, the cancer death rate of females actually and relatively exceeds the rate of males, but the relative excess is highest at ages 35 to 44, when the rate for females exceeds the rate for males by 175.5 per cent.

The question whether the observed increase in cancer has affected all ages or only certain periods of life is naturally of great importance. In Tables 11 and 12 the cancer death rate for males and females for the United States registration area are compared for the two periods, 1903-1907 and 1908-1912.

TABLE 11.—MORTALITY FROM CANCER OF ALL ORGANS OR PARTS, BY AGES, AMONG MALES, UNITED STATES REGISTRATION AREA, PERIODS 1903-1907 AND 1908-1912

Ages at Death	1903-1907		1908-1912		Increase or Decrease	
	Deaths from Cancer	Rate per 100,000 Population	Deaths from Cancer	Rate per 100,000 Population	Actual	Per cent.
Under 10	455	2.4	715	2.6	+ 0.2	+ 8.3
10-24	840	3.2	1,188	3.1	- 0.1	- 3.1
25-34	1,527	9.0	2,230	9.0	.....	.....
35-44	4,497	33.4	6,253	31.7	- 1.7	- 5.1
45-54	9,509	103.8	14,922	106.5	+ 2.7	+ 2.6
55-64	13,463	245.7	21,864	265.1	+ 19.4	+ 7.9
65-74	12,588	427.4	21,157	469.5	+ 42.1	+ 9.9
75 and over	6,466	553.9	11,915	663.2	+ 109.3	+ 19.7
All ages *	49,458	52.7	80,326	57.7	+ 5.0	+ 9.5
45 and over	42,026	224.1	69,858	244.6	+ 20.5	+ 9.1

* Including unknown ages.

TABLE 12.—MORTALITY FROM CANCER OF ALL ORGANS OR PARTS, BY AGES, AMONG FEMALES, UNITED STATES REGISTRATION AREA, PERIODS 1903-1907 AND 1908-1912

Ages at Death	1903-1907		1908-1912		Increase or Decrease	
	Deaths from Cancer	Rate per 100,000 Population	Deaths from Cancer	Rate per 100,000 Population	Actual	Per cent.
Under 10	381	2.1	603	2.3	+ 0.2	+ 9.5
10-24	753	2.8	1,091	2.9	+ 0.1	+ 3.6
25-34	3,302	20.7	4,589	20.4	- 0.3	- 1.4
35-44	11,068	90.2	15,711	88.1	- 2.1	- 2.3
45-54	18,788	223.0	27,881	222.7	- 0.3	- 0.1
55-64	20,196	378.1	30,197	392.1	+ 14.0	+ 3.7
65-74	16,559	540.9	26,451	582.5	+ 41.6	+ 7.7
75 and over	8,916	667.0	15,685	778.6	+ 111.6	+ 16.7
All ages *	80,126	87.7	122,295	92.6	+ 4.8	+ 5.5
45 and over	64,459	354.9	109,214	374.3	+ 19.4	+ 5.5

* Including unknown ages.

The results of the comparison are extremely interesting and of exceptional practical utility.

The increase in cancer mortality has naturally varied considerably according to the organs and parts of the body affected. It would carry me too far to discuss these important aspects of the cancer problem in detail, but for the purpose of emphasizing the importance of special cancer studies, Tables 13 and 14, showing occurrence of cancer of the female generative organs and of the female breast, are included.

TABLE 13.—MORTALITY FROM CANCER OF THE FEMALE GENERATIVE ORGANS, UNITED STATES REGISTRATION AREA, PERIODS 1903-1907 AND 1908-1912

Ages at Death	1903-1907		1908-1912		Increase or Decrease	
	Deaths from Cancer	Rate per 100,000 Population	Deaths from Cancer	Rate per 100,000 Population	Actual	Per cent.
Under 10	8	0.0	23	0.1	+ 0.1	+ 125.0
10-24	134	0.5	236	0.6	+ 0.1	+ 20.0
25-34	1,158	7.3	1,831	8.2	+ 0.9	+ 12.3
35-44	3,836	31.3	5,984	33.6	+ 2.3	+ 7.3
45-54	5,810	69.0	9,090	72.6	+ 3.6	+ 5.2
55-64	4,529	84.8	7,391	96.0	+ 11.2	+ 13.2
65-74	2,440	79.7	4,463	98.3	+ 18.6	+ 23.3
75 and over	886	66.3	1,870	92.8	+ 26.5	+ 40.0
All ages *	18,840	20.6	30,907	23.4	+ 2.8	+ 13.6
45 and over	13,665	75.3	22,814	85.2	+ 9.9	+ 13.1

* Including unknown ages.

TABLE 14.—MORTALITY FROM CANCER OF THE FEMALE BREAST, UNITED STATES REGISTRATION AREA, PERIODS 1903-1907 AND 1908-1912

Ages at Death	1903-1907		1908-1912		Increase or Decrease	
	Deaths from Cancer	Rate per 100,000 Population	Deaths from Cancer	Rate per 100,000 Population	Actual	Per cent.
Under 10	.....	.....	8	0.0	.....	....
10-24	15	0.1	34	0.1	.....	....
25-34	343	2.2	575	2.6	+ 0.4	+ 18.2
35-44	1,683	13.7	2,900	16.3	+ 2.6	+ 19.0
45-54	2,667	31.6	4,861	38.8	+ 7.2	+ 22.8
55-64	2,684	50.3	4,362	56.6	+ 6.3	+ 12.5
65-74	2,061	67.3	3,622	79.8	+ 12.5	+ 18.6
75 and over	1,330	99.5	2,506	124.4	+ 24.9	+ 25.0
All ages *	10,801	11.8	18,884	14.3	+ 2.5	+ 21.2
45 and over	8,745	48.1	13,351	57.3	+ 9.2	+ 19.1

* Including unknown ages.

The estimated total mortality from cancer by organs and parts of the body in the continental United States for the year 1913, on the basis of an aggregate mortality of 73,279, is shown in Table 15.

TABLE 15.—ESTIMATED TOTAL MORTALITY FROM CANCER, BY ORGANS AND PARTS, IN CONTINENTAL UNITED STATES, 1913.

	Rate per 100,000 Population	Number of Deaths	Percentage of Distribution
Buccal cavity	3.11	3,007	3.94
Stomach and liver.....	31.23	30,215	39.59
Peritoneum, intestines and rectum.....	10.47	10,128	13.27
Female generative organs.....	12.17	11,776	15.43
Female breast.....	7.25	7,021	9.20
Skin	2.73	2,633	3.45
Other organs or parts.....	11.92	11,539	15.12
All organs and parts.....	78.88	76,319	100.00

Important variations are found in the cancer death rates according to organs and parts of the body, and for the purpose of illustration, the cancer mortality for the cities of Boston and San Francisco is shown in Tables 16 and 17.

TABLE 16.—MORTALITY FROM CANCER IN BOSTON, MASS., BY ORGANS AND PARTS, ACCORDING TO SEX, 1903-1912

Organ or Part	Male and Female		Male		Female	
	Deaths from Cancer	Rate per 100,000 Population	Deaths from Cancer	Rate per 100,000 Population	Deaths from Cancer	Rate per 100,000 Population
Buccal cavity.....	308	4.9	248	8.0	60	1.9
Stomach and liver.....	2,027	31.9	918	29.5	1,109	34.2
Peritoneum, intestines and rectum.....	1,127	17.7	446	14.3	681	21.0
Female generative organs.....	921	14.5	.....	....	921	28.4
Breast	657	10.3	7	0.2	650	20.1
Skin	82	1.3	44	1.4	38	1.2
Other or not specified organs.....	1,318	20.7	679	21.8	639	19.7
All organs and parts.....	6,440	101.3	2,342	75.2	4,098	126.5

TABLE 17.—MORTALITY FROM CANCER IN SAN FRANCISCO, CAL., BY ORGANS AND PARTS, ACCORDING TO SEX, FROM JULY 1, 1906, TO JUNE 30, 1913

Organ or Part	Male and Female		Male		Female	
	Deaths from Cancer	Rate per 100,000 Population	Deaths from Cancer	Rate per 100,000 Population	Deaths from Cancer	Rate per 100,000 Population
Buccal cavity.....	186	6.5	172	10.6	14	1.1
Stomach and liver.....	1,377	48.0	878	54.1	499	40.1
Peritoneum, intestines and rectum.....	442	15.4	223	13.7	219	17.6
Female generative organs.....	406	14.2	.....	....	406	32.6
Breast	253	8.8	1	0.1	252	20.2
Skin	67	2.3	41	2.5	26	2.1
Other or not specified organs.....	467	16.4	336	20.8	131	10.6
All organs and parts.....	3,198	111.6	1,651	101.8	1,547	124.3

Aside from locality, the cancer death rate is materially modified by race. Table 18 shows the rate for the District of Columbia for the decade ending 1910.

TABLE 18.—MORTALITY FROM CANCER IN THE DISTRICT OF COLUMBIA, U. S. A., 1901-1910, BY AGE, SEX AND RACE; RATE PER 100,000 OF POPULATION

Ages	White		Colored	
	Males	Females	Males	Females
Under 10	1.7	0.6	.....	2.7
10-19	4.2	1.7	.....	1.1
20-29	5.8	3.1	9.7	13.1
30-39	23.2	56.0	26.3	72.3
40-49	62.5	162.2	48.7	207.3
50-59	182.4	347.3	139.6	328.9
60-69	413.7	456.4	310.1	386.6
70 and over	610.6	556.9	335.1	522.1
All ages	70.6	104.8	38.6	86.5
40 and over	217.1	312.0	130.2	293.9

It is shown that at all ages of 40 and over, the cancer death rate of white men was 217.1, and of colored men, 130.2. The rates, however, approach each other much more closely in the case of women, it being shown that the cancer death rate for white women was 312 and for colored women 293.9. As an interesting sidelight on the influence of race on the cancer death rate, a table for the island of Ceylon is included (Table 19), showing the cancer mortality for the different racial elements of the island for the period 1908-1912.

TABLE 19.—MORTALITY FROM CANCER BY RACES, CEYLON, 1908-1912

Race	Total Population	Deaths from Cancer	Rate per 100,000 of Population
Europeans	37,646	6	15.9
Burghers	131,252	34	25.9
Sinhalese	13,245,206	962	7.3
Tamils	5,488,143	296	5.4
Moors	1,298,270	84	6.5
Malays	63,082	2	3.2
Others	85,466	7	8.2
Total	20,349,065	1,391	6.8

The very low rate of 6.8 for the island of Ceylon is almost entirely due to cancer of the buccal cavity, which is directly attributable to the universal habit of betel-nut chewing. Granting that the cancer returns for Ceylon are not of a high degree of intrinsic trustworthiness comparable with the United States registration area or European countries, there can be no doubt but that, in the main, malignant disease is comparatively rare, not only in Ceylon, but also in India and other parts of Asia.

That the observed variations in cancer frequency throughout the world are not primarily determined by possible errors of diagnosis or defective methods of death registration, is clearly shown by the comparative study of cancer death rates in civilized countries according to organs and parts of the body affected. This aspect of the cancer problem has thus far received inadequate consideration, but the data are unquestionably of the greatest practical significance in the statistical study of cancer occurrence. Table 20 exhibits the comparative frequency of cancer of the stomach, liver and œsophagus in thirteen different countries of the world for the period 1906-1910.

TABLE 20.—COMPARATIVE FREQUENCY OF CANCER OF THE STOMACH, LIVER AND ŒSOPHAGUS IN THIRTEEN DIFFERENT COUNTRIES OF THE WORLD, PERIOD 1906-1910; RATE PER 100,000 OF POPULATION

Switzerland	70.4	England and Wales.....	31.4
Holland	62.2	Ireland	31.0
Norway	61.4	United States Registration Area.....	28.3
Bavaria	59.4	Australia Commonwealth †.....	27.4
Japan*	40.0	Italy	26.2
Scotland	36.0	Cuba †	12.7
Uruguay	35.6		

* Period 1909-1910. † Period 1908-1912.

The international contrast presented by this table is of unusual interest. It is shown that the mortality from cancer of the stomach, liver and œsophagus was relatively higher in Uruguay and Japan, than in the United States registration area and England and Wales. No defects in registration or errors in diagnosis could possibly account for such profound differences in the specific incidence of cancer occurrence

limited to a thoroughly well-understood group of malignant affections. Table 20 also brings out the fact that the rate for this group of cancers was over twice as high in Switzerland and Holland as in the United States registration area. It would seem absurd to maintain in the face of this evidence that the observed differences in the rates of cancer frequency are primarily determined by accuracy in diagnosis or completeness in methods of death registration and analysis. In other words, the excess or deficiency in the specific cancer death rates by organs and parts of the body must be accounted for by determinable variations in local conditions, particularly as regards the mode of life, the food, the nutrition, etc., of the localities or countries considered.

A similar comparison for eleven countries is made of the mortality of cancer of the skin in Table 21.

TABLE 21.—COMPARATIVE FREQUENCY OF CANCER OF THE SKIN IN ELEVEN DIFFERENT COUNTRIES OF THE WORLD, PERIOD 1906-1910; RATE PER 100,000 OF POPULATION

United States Registration Area.....	2.7	Scotland	1.7
Ireland	2.7	Holland	1.4
Australian Commonwealth*.....	2.3	Uruguay	1.1
England and Wales.....	2.1	Bavaria	0.8
Cuba*	2.0	Japan †	0.7
Switzerland	1.9		

* Period 1908-1912. † Period 1909-1910.

It is shown that Scotland, Switzerland and Japan have distinctly low rates of mortality in cancer of the skin, whereas the rates are distinctly excessive for the United States registration area, Ireland and the Australian Commonwealth.

Even more interesting in this respect are the wide variations in the comparative frequency rates of cancer of the female generative organs. Table 22 shows the rates for thirteen different countries of the world.

TABLE 22.—COMPARATIVE FREQUENCY OF CANCER OF THE FEMALE GENERATIVE ORGANS IN THIRTEEN DIFFERENT COUNTRIES OF THE WORLD, PERIOD 1906-1910; RATE PER 100,000 OF FEMALE POPULATION

England and Wales.....	24.2	Italy	16.0
United States Registration Area.....	22.1	Australian Commonwealth †.....	15.5
Bavaria	21.6	Holland	13.2
Switzerland	21.4	Ireland	12.8
Japan*	20.9	Uruguay	12.2
Scotland	20.6	Norway	11.5
Cuba †	18.9		

* Period 1909-1910. † Period 1908-1912.

The highest rates are shown to prevail in England and Wales, followed by the United States registration area and Bavaria. The lowest

rates are for Norway, Uruguay and Ireland. If the argument were sound that a low cancer death rate must be considered evidence of imperfect diagnostic skill or defective methods of death registration, Norway would rank first as regards diagnosis of cancer of the stomach, liver and œsophagus and last as regards diagnosis of cancer of the female generative organs. It would also follow that since the rate for Scotland was about the same as for Japan, the diagnosis of cancer of the female generative organs was about equally well-developed in these two countries, though widely at variance on the basis of the same hypothesis in cancer of the skin.

Finally, the comparative frequency rates for cancer of the female breast are of special interest, since this form of cancer is, perhaps, the most accurately diagnosed in the entire group of malignant diseases. Table 23 shows the mortality from cancer of the female breast in thirteen different countries of the world per 100,000 of female population.

TABLE 23.—COMPARATIVE FREQUENCY OF CANCER OF THE FEMALE BREAST IN THIRTEEN DIFFERENT COUNTRIES OF THE WORLD, PERIOD 1906-1910; RATE PER 100,000 OF FEMALE POPULATION

England and Wales.....	17.9	Bavaria	9.1
Scotland	15.4	Norway	7.3
Ireland	14.0	Italy	5.8
Switzerland	13.6	Cuba*	4.5
United States Registration Area.....	13.3	Uruguay	3.7
Australian Commonwealth*.....	10.6	Japan †	1.8
Holland	9.6		

* Period 1908-1912. † Period 1909-1910.

Recalling that the mortality from cancer of the female generative organs was practically the same in Japan and Scotland, it is shown by Table 23 that there was an immense disparity in the relative frequency rates for cancer of the female breast; in fact, the rate for England and Wales is almost exactly *ten times the rate for Japan*. Such differences as these are conclusive evidence that the variations observed in crude cancer death rates are evidently determined by profound differences in the specific cancer frequency according to organs and parts of the body affected. It is in this direction that statistical research can be of most value to the cancer cause, for by determining the precise differences in local variations of incidence according to the seat of primary growth, it may be possible in time to ascertain the contributory conditions or circumstances responsible for these observed and clearly established variations. The attainment of this purpose however, requires the perfection of the rules of statistical practice, the adoption of standard methods of tabulation and analysis, the gen-

eral use of the international classification of causes of death, and the extended use of the details of that classification by specified organs or parts of the seat of primary growth. These brief considerations are merely intended to emphasize the practical utility of statistical research in the furtherance of the cancer cause. The subject is of vast extent, extremely complicated, but fruitful of useful results.

Among important lines of collateral statistical research a brief reference may be made to the study of precise correlation of the comparative frequency or changes in frequency occurrence of cancer and other more or less allied diseases, such as benign tumors, biliary calculi, etc. Furthermore, this line of inquiry should be extended to include such diseases as diabetes, appendicitis, rheumatism, gout, syphilis, tuberculosis, malaria, etc. Most of the present-day conclusions regarding the correlation of cancer to any and all of these, as well as other, diseases are based on a rather superficial consideration of all the statistical evidence which requires to be taken into account. So far as practicable, extended consideration has been given to these more involved aspects of the cancer problem in my forthcoming work on *The Mortality from Cancer Throughout the World*.

In its final analysis the statistical method is of the first order of importance in determining the tendency of the cancer death rate. In strict conformity to the law of large numbers, the conclusions improve in accuracy in proportion to the amount of data considered. Table 24 shows the increase in the cancer death rate in the New England States, New York and New Jersey, combined, for the period 1886-1913.

TABLE 24.—MORTALITY FROM CANCER IN THE NEW ENGLAND STATES, NEW YORK AND NEW JERSEY, PERIOD 1886-1913

Years	Population	Deaths from Cancer	Rate per 100,000 Population	Index Number
1886-1890	55,320,449	26,215	47.4	100.0
1891-1895	64,879,439	34,536	53.2	112.2
1896-1900	71,405,669	44,645	62.5	131.9
1901-1905	78,132,762	55,501	71.0	149.8
1906-1910	87,343,060	69,140	79.2	167.1
1911	18,699,051	15,980	85.5	180.4
1912	18,976,968	16,640	87.7	185.0
1913	19,327,233	17,385	90.0	189.9

It is shown that the relative cancer death rate, assuming the rate for the period 1886-1890 as 100, is now 189.9, or, in other words, there has been an increase in the cancer death rate of 89.9 per cent. during the intervening period of twenty-three years.

A similar comparison is presented in Table 25, for twenty large American cities for the period 1881-1913.

TABLE 25.—MORTALITY FROM CANCER IN TWENTY LARGE AMERICAN CITIES, PERIOD 1881-1913

Years	Population	Deaths from Cancer	Rate per 100,000 Population	Index Number
1881-1885	30,328,347	14,735	48.6	95.9
1886-1890	35,302,944	17,824	50.7	100.0
1891-1895	40,912,510	22,513	55.0	108.5
1896-1900	47,016,267	28,533	60.7	119.7
1901-1905	53,386,935	37,127	69.5	137.1
1906-1910	60,116,913	47,701	79.3	156.4
1911	12,849,687	10,713	83.4	164.5
1912	13,125,121	11,203	85.4	168.4
1913	13,400,553	11,971	89.3	176.1

Assuming, again, the period 1886-1890 to be represented by 100, the relative rate for 1913 was 176.1, in other words, in the twenty cities referred to, during the last twenty-three years the cancer death rate has increased 76.1 per cent.

In conclusion, the comparative rates are shown for twenty American and ten large European cities, in Table 26:

TABLE 26.—COMPARISON AS TO MORTALITY FROM CANCER, IN TWENTY AMERICAN AND TEN EUROPEAN CITIES; PERIOD 1881-1912

Years	American Cities		European Cities		Differen in Rate
	Cancer Death-Rate per 100,000 Population	Index Number	Cancer Death-Rate per 100,000 Population	Index Number	
1881-1885	48.6	100	75.4	100	26.8
1886-1890	50.7	104	82.0	109	31.3
1891-1895	55.0	113	87.9	117	32.9
1896-1900	60.7	125	97.2	129	36.5
1901-1905	69.5	143	106.2	141	36.7
1906-1910	79.3	163	114.4	152	35.1
1911	83.4	172	114.7	152	31.3
1912	85.4	176	118.3	157	32.9

The evidence presented by these tables, as well as the additional information derived from other equally trustworthy sources, unconditionally confirms the conclusion that cancer is relatively on the increase throughout the civilized world, and that the increase is affecting practically all important organs and parts of the body, but chiefly for the age period of 50 and over. It would therefore seem entirely appropriate to refer to the present situation as a menace to civilized mankind, and to insist on the duty of the heartiest and most thorough nation-wide cooperation in the effort to bring about an aroused public interest in a subject, than which, considering the enormous amount of human suffering and loss of life, none can appeal more powerfully to the sympathy and scientific interest of the world.



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